2016 Performance Measures Committee Report

CASA

Prepared by the
Performance Measures Committee
for the
Clean Air Strategic Alliance
Board of Directors

July 2017

Table of Contents

Acknowledgements

The Committee would like to thank various CASA team members and implementers for their assistance in reviewing the implementation of past CASA project team recommendations and in gathering the information required to prepare this report. In particular Bob Myrick, Richard Melick, Lucas Zhang, Casandra Brown, Celeste Dempster, Randy Dobko and Andrew Clayton assisted in gathering this information.

It should be noted that the Performance Measures Committee (PMC) does not meet CASA's standards for quorum, but, as the work needed to proceed, a decision was made to proceed with the available membership. The members of the Committee are: Keith Denman (CASA) and Ruth Yanor (Mewassin Community Council). Additional members would be welcomed. We would like to thank previous members David Lawlor and Martina Krieger for their work over the last few years.

Executive Summary

In March 2016, the CASA board approved the new CASA Performance Measurement Strategy. The strategy ensures transparency and accountability in the performance measurement process, and reflects stakeholder satisfaction in elements of project team work. The strategy contains modified performance measures and indicators for the Secretariat, the Board, and goals from CASA's Strategic Plan as well as project teams. These modified measures and indicators were incorporated with CASA's pre-existing metrics and reorganized according to the definitions of performance measure and indicator achieved in the first revision of the strategy undertaken in 2012.

The Performance Measures Committee was charged with two tasks:

1. To calculate CASA's performance measures and indicators, and
2. To follow-up on low-rated recommendations from previous years.

The Committee calculated the results of CASA's performance measures and indicators which are outlined in Tables 1 and 2 respectively. Performance indicators are not compared to a target, but rather provide the context in which CASA works.

The Committee collected updates on the low-rated recommendations from previous years which are tracked in a living document called the low-rated recommendations matrix. In light of this information, the committee will provide feedback on the following recommendations from the following past project teams:

- 2002 Acidifying Emissions Project Team (1 recommendation)
- 2008 EFR recommendation: Deemed Credit Threshold (1 recommendation)
- 2013 Ambient Monitoring Strategic Planning Project Team (2 recommendations)
- 2015 Electricity Framework Review (3 Recommendations)

Introduction

In June 2016, the CASA board approved the new CASA Performance Measurement Strategy. The review of the strategy involved investigating the alignment between performance measurement and CASA's audience, mission, vision, Strategic Plan, strategic plan goals, principles and criteria, as well as conducting consultations with current CASA project team co-chairs, the CASA Communications Committee, the CASA Board and a survey design expert from Alberta Environment and Parks (AEP).

The strategy provides definitions of performance measure (areas where CASA has a higher degree of control over results) and performance indicator (areas where CASA has a lower degree of control over results). This combination of performance measures and performance indicators provides a well-rounded description of CASA as an organization and, through providing timely and meaningful information, supports continuous improvement at CASA.

Some of CASA's performance measures and indicators are calculated annually and some are calculated every three years. The three-year metrics are due and will be reported on in this report.
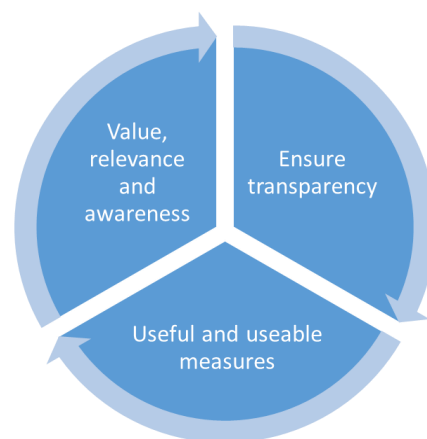
Performance Measures

Table 1 outlines the 2016 performance measures results.

Table 1: Performance Measures (* indicates that the measure will be included only in the PMC Annual Report and <u>NOT</u> in the CASA Annual Report. These measures are for internal consideration only. All other measures will be included in the PMC <u>and</u> the CASA Annual Report)

Objective			Performance Measure	Target	Actual	Notes
Ensure that CASA is financially efficient and accountable.	1.		Sufficient operating funds are available to bridge CASA's and Government of Alberta (GoA)'s fiscal years.	3 months of operating funds	~ 6 months as of December 31, 2017	Based on estimated operating expenses for January through March.
Implement the CASA Strategic Plan.	2.		*Percentage of objectives from the Strategic Plan listed as in progress or complete (according to the Secretariat's colour coded rating system).	Goal 1 100% / Goal 2 100% / Goal 3 100% / Goal 4 100%	Goal 1 100% / Goal 2 90% / Goal 3 40% / Goal 4 58%	Some initiatives under Goals 3 and 4 have been moved to the Environmental Monitoring and Science Division (EMSD) within AEP or are beyond CASA's available resources in the current fiscal climate.
Monitor the implementation of CASA recommendations.	3.	a.	*Percentage of low-rated recommendations being monitored.	100%	100%	Currently monitoring seven low rated recommendations.
		b.	*Percentage of administrative and operational recommendations from the previous four years that have been implemented.	Administrative 100% / Operational 100%	Administrative 100% / Operational 100%	This work examines the recommendations for the previous four years (2012 – 2015). The bulk of these refer to work CASA has agreed to do at a future date.
Provide support to CASA stakeholders.	4.	a.	*Degree of satisfaction with support provided by Secretariat.	Awareness Maintain or increase / Value Maintain or increase / Relevance Maintain or increase	Awareness – High Value – medium (varies) Relevance – medium (varies)	CASA 2.0 work is intended to address this area of work and progress is being made as we focus on areas important to our stakeholders.
		b.	*Project teams' degree of satisfaction with support provided by Secretariat.	Maintain or increase	Increase – 85%	Data focuses on the NPS team's work and was somewhat limited due to delays in implementing the meeting surveys Was 75% in 2015.

Objective			Performance Measure	Target	Actual	Notes
Encourage Board member participation in CASA.	5.	a.	Percentage of Board attendance at Board meetings by sector.	75%	Government – 57%[1] Industry – 83%[2] Non-Governmental Organizations (NGOs) – 73%[3]	The target for government and the NGO caucus were not met. The government caucus consists of federal, provincial, municipal, First Nations, and Métis representatives. Low attendance may reflect on a lack of current teams addressing issues for some stakeholders. Sectors without current representation

[1] Government attendance:
Aboriginal (First Nations): ……………………………………… 0%
Aboriginal (Metis): ……………………………………………….. 0%
Federal: …………………………………………………………… 100%
Local (Rural): …………………………………………………. 100%
Local (Urban): Vacant, not included in totals
Provincial (Energy): ………………………………………….. 67%
Provincial (Environment): ………………………………….. 100%
Provincial (Health): ……………………………………………. 33%

[2] Industry attendance:
Agriculture: ………………………………………………………... 100%
Alternate Energy: ………………………………………………… 67%
Chemical Manufacturers: …………………………………….. 100%
Forestry: ………………………………………………………….... 33%
Mining: …………………………………………………………… 67%
Oil & Gas – Large: ……………………………………………… 100%
Oil & Gas – Small: Vacant, not included in totals
Petroleum Products: ………………………………………………… 100%
Utilities: …………………………………………………………….. 100%

[3] NGO attendance
NGO Health…………………………………………………….67%
NGO Rural…………………………………………………….33%
NGO Industrial…………………………………………………100%
NGO Urban…………………………………………………...100%
Consumer Transportation………………………………………67%

Objective		Performance Measure	Target	Actual	Notes

					are not included in the calculations.
					
					2015 Results:
					    Government – 52%
					    Industry – 92%
					    NGO – 100%

	b.	*Project teams' degree of satisfaction with support provided by Board member counterparts, by sector.	Maintain or increase	Government – 80%
				Industry – 100%
				NGO – 100%
					2015 results:
					    Government – 100%
					    Industry – 100%
					    NGO – 75%

Develop reports and recommendations adhering to CASA's managing collaborative processes guide.	6.	Degree of satisfaction with project team work by team: ○ The Project Charter was completed. ○ The process was collaborative. ○ The team developed recommendations using the SMART (Specific, Measurable, Actionable, Realistic, Time-bound) model.	Project Charter complete — 75% Collaborative — 75% SMART Recs. — 100%	Project Charter complete — 75% Collaborative — 75% SMART Recs. — n/a	The only team which completed its work in 2016 was the "CASA 2.0" process, which was atypical and for which these measures are only partially applicable. The Non-Point Source team is on track to complete its work as set out in the Project Charter.
Improve project team knowledge of the managing collaborative processes guide.	7.	Project teams' degree of satisfaction with ability to participate in collaborative processes.	Maintain or increase	70%	Reflects the Non-Point Source and CASA 2.0 teams. 58% in 2015.
Increase awareness of CASA, CASA projects and the managing collaborative processes guide.	8.	Speaking engagements and meetings undertaken by CASA's Executive Director.	Maintain or increase	18	Down slightly from last year. 2015 had 20 total.

Recommendation 1: Approve performance measures results.
The Performance Measures Committee recommends that the Board approve the 2016 performance measures results for inclusion in the 2016 CASA Annual Report.

Performance Indicators

Table 2 provides a summary of the 2016 performance indicator results. Additional information can be found in Appendix 2.

Table 2: Performance Indicators Summary (all indicators will be included in CASA's Annual Report)

Objective		Performance Indicator	Actual	Notes
Implement CASA recommendations.	1.	Percentage of substantive recommendations from the previous 4 years that have been implemented.	57%	See "Additional Information in Appendix 1 - Section 1". Note that this % is based on 4 recommendations that were classified as substantive.
Measure impact of completed project team work.	2.	*Each completed project team comes up with one specific metric to measure success of team 5 years in the future.	N/A	No team metrics were scheduled for reporting in 2016.

Objective		Performance Indicator	Actual	Notes
Track Air Quality in Alberta	3.	*Measured every three years – 2016		See Appendix Five for Air Quality results
Improve capacity to monitor Air Quality in Alberta	4.	The percentage of monitoring stations and/or parameters implemented from the 2009 Ambient Monitoring Strategic Plan (AMSP)	Overall 57%	See Appendix Four for detail
		Geographic percentage of province covered by airshed zones	46%	The Peace River Air Monitoring Program (PRAMP) has been recognized as an Airshed by the Monitoring and Science Division and by the Airsheds Council but has not yet been endorsed by CASA. Without PRAMP the number drops to 45%.

Recommendation 2: Approve performance indicators results.
The Performance Measures Committee recommends that the Board approve the results of the 2016 performance indicators for inclusion in the 2016 CASA Annual Report.

Review of Past CASA Recommendations

In June 2008 the CASA Board identified the need to follow-up on low-rated recommendations on a longer term basis, rather than just the one year snapshot provided in the related performance indicator. The Committee developed a matrix of all low-rated recommendations since 1997 as well as a Decision Tree for assessing low-rated recommendations which was approved by the Board in 2009 (see Appendix 2). The matrix is intended to be a living document that will be updated as the Committee gathers information from implementers. The Committee will then use this information to advise the CASA Board on appropriate follow-up for the low-rated recommendations.

The CASA Board has the final decision whether to consider a recommendation closed (i.e. CASA no longer pursues information on its implementation). There are three criteria to weigh in the decision that were approved by the Board in September 2009:

1. Priority level: Is the current importance of the issues and/or recommendation high, medium or low?
2. Need for the recommendation: Given legal, technological, societal and economic changes since the recommendation was made, is the action prescribed still needed?
3. Practical challenges: Given the current work of the implementing body, are the necessary resources and capacity available to implement the recommendations?

The Committee is tracking the following low-rated recommendations, and received instruction from the Board in 2016 to maintain them on the list. Further guidance may be offered by the Board when this report is received.

Recommendation	Update
2002	
Acidifying Emissions Project Team	
3. Alberta Environment should lead an evaluation of the acidifying emissions management system every two to three years based on the evaluation process that has been established by the Acidifying Emissions Implementation Team (AEMIT). Evaluation results should be reported to the CASA Board and the next evaluation should be done in 2003. This task would require Alberta Environment to complete the forms that AEMIT has developed and used to conduct its evaluation; these are: • the goals, objectives and performance measures table, and • the evaluation protocols table.	As of spring 2017: The Acid Deposition Framework, including the modeling software used in the analysis, is currently being reviewed and the CASA board will be provided with an update when available.
2009	
2008 Electricity Framework Review (EFR) Team	

7. The following deemed credit thresholds for the 2011 BATEA standards be applied to new coal-fired and gas-fired units: A. NOx (coal-fired) – 0.38 kg/MWh net B. SO2 – 0.55 kg/MWh net C. NOx (gas-fired) – "A" factor = 0.07 kg/MWh net and "B" factor = 0.008 kg/GJ Non-Peaking Standard Formula: NOx (kg/h) = [Net Power Output (MW net) x A] + [Heat Output (GJ/h) x B]	The 2013 EFR Team agreed that this recommendation has not been implemented. This is because it is felt that the renewed Climate Change Strategy may affect parts of the Framework. Once the Strategy is complete, the recommendation will be revisited. The consensus recommendations are being used informally by ESRD but have not been formally incorporated into standards, in part because no new plants have been approved since January 1, 2011.

2013	
Ambient Monitoring Strategic Planning (AMSP) Project Team	
18. The AMSP team recommends that the MIC: • Do a scientific, objective analysis to determine the appropriate network density for a province-wide network that will spatially represent air quality in Alberta. • Use industry, airshed and government monitoring stations where possible to address gaps in air monitoring. An assessment of where these gaps are and what stations could be used to fill these gaps is required.	Update as of May 2017 from AEP's Monitoring and Science division: The analysis indicated by this recommendations has been initiated for selected airsheds in the province. In the 2017-18 fiscal year, an analysis will be completed for the province.
26. The AMSP Project Team recommends that: Alberta Environment develop and maintain a comprehensive GIS-based provincial inventory of all relevant emission sources that influence provincial air quality commencing within one year following board approval.	The current provincial air emissions inventory is not GIS-based and not as comprehensive as it needs to be. The provincial air emissions inventory is also not presently being maintained, lacking information past the year 2010. (AEP) has established modernized air emission inventory reporting requirements, under the revised Air Monitoring Directive, that apply to large Environmental Protection and Enhancement Act (EPEA) approved industrial operations. These new reporting requirements will come into force in 2019 and will require detailed air emission inventory information be submitted to AEP annually. The current plan is to use the emissions information that will coming into AEP to help update and enhance the provincial air emissions inventory. Overall, AEP has yet to fully satisfy this CASA recommendation. **Further Information provided by: Richard Melick, Air Policy – AEP (2017)**

I believe the CASA Performance Measures Committee has been using data from Environment and Climate Change Canada's Air Pollutant Emissions Inventory (APEI). The main benefits of the APEI are that it is publicly available and does provide a fairly consistent dataset for emissions of the criteria pollutants going all the way back to the 80's/90's. It is therefore useful for looking at provincial emission trends and time series. While the APEI dataset does provide useful provincial emission totals going back many years, it is not sufficiently detailed or adequately broken down (to Alberta's Air Zones / Land Sue Framework management regions) for what AEP requires.

AEP's current emissions inventory requirements are set out in the 1989 Air Monitoring Directive, with the data collected typically limited to NOx, SO2 and some other varying reported substances. In 2010, we did carry out an industrial air emissions survey that collected detailed 2006-2008 emissions data for 25 pollutants. This was just a one-time survey of Alberta's large industrial facilities, and it is still be used today as part of the provincial air emissions inventory. As AEP requires detailed emissions information for the large EPEA approved facilities, our emissions inventory reporting requirements have now been updated via the revised Air Monitoring Directive. Beginning in 2019 (for 2018 emissions), we will be collecting detailed stack-level emissions data from the EPEA approved industrial facilities.

The main reasons for the long delay between our 2010 industrial air emissions survey and the new emissions reporting requirements were: five years were spent updating the Air Monitoring Directive, there was an extended consultation period on the new reporting requirements, and two years were given to industry to get ready for the new reporting requirements.

At some point in the future, it will likely make sense to begin to use the new comprehensive AMD emissions inventory dataset for tracking emission levels instead of the APEI. This will have to wait until we have a few years of data collected and a way to try to reconcile our data with that of Environment and Climate Change Canada's. The CASA Performance Measures Committee should likely continue to use the APEI for at least the next few years.

Summary of PMC Recommendations

Recommendation 1: Approve performance measures results.
The Performance Measures Committee recommends that the board approve the 2016 performance measures results for inclusion in the 2016 CASA Annual Report.

Recommendation 2: Approve performance indicators results.
The Performance Measures Committee recommends that the board approve the results of the 2016 performance indicators for inclusion in the 2016 CASA Annual Report.

Appendix 1: Additional Information for Table 2 (Performance Indicators)

<u>Performance Indicator 1:</u> Percentage of substantive recommendations in the last four years (2012 onwards) that have been implemented.

For 2016, the Performance Measures Committee considered the recommendations approved by the CASA Board in 2012, 2013, 2014 and 2015. In these years, the CASA board approved one recommendation from the Confined Feeding Operations Project Team, two recommendations from the PM and Ozone Implementation Team, one recommendation from the Human and Animal Health Team, one from the Odour Management team and twelve from the Electricity Framework Review. Of these, one recommendation from the PM and Ozone Implementation Team and three recommendations from the Electricity Framework Review were deemed substantive. The remaining recommendations were deemed either administrative or operational and so are only recorded under performance measure 3.b.

Overall, the degree of implementation of CASA recommendations in 2016 is 57%. Table 1 shows the rating of the substantive recommendation and subsequent calculation of overall implementation of recommendations and Table 2 summarizes the results since 1997.

Table 1: Rating of Substantive Recommendations

Project Team (No. of substantive recommendations)	Rating of Recommendations (Original recommendation numbers placed in appropriate rating column)										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PM & Ozone Implementation Team (1)									2		
Electricity Framework Review (3)						5,6,7					
Total number (4)						3			1		

Mean Calculation: ((8 x 1) + (3 x 5))/4 = 5.74
Overall (average rating) = 57%
<u>Reviewer</u>: PM & Ozone Implementation Team: Bob Myrick (AEP - MSD)
<u>Comments:</u> This recommendation was essentially implemented as planned from a technical perspective. The technical expertise in the AEP Air Policy group was available and part of the development of the CAAQS. However, there were no additional CASA teams developed to assess the CAAQS during the transition from Canada-wide Standards to CAAQS.
<u>Reviewer:</u> Electricity Framework Review Team (Randy Dobko AEP – Air Policy)
<u>Comments:</u> Many of the items relating to the electricity system are currently under review and a further update on specific items will depend on the outcome of this review.

Table 2: Summary of Results for Recommendation Implementation

Year Approved by CASA Board	Number of Substantive Recommendations	Degree of Implementation of Substantive Recommendations (%)

1997	25	77
1998	54	76
1999	30	62
2000	0	n/a
2001	5	94
2002	53	74
2003	79	73
2004	47	91
2005	18	77.2
2006	1	100
2007	1	30
2008	2	90
2009	13	42
2010	1	100
2011	0	n/a
2012	0	n/a
2013	1	70
2014	0	n/a
2015	3	50
2016	0	n/a

Appendix 2: Decision Tree for Low-Rated Recommendations

Three years after a substantive recommendation has been approved by the CASA Board, CASA assesses the implementation of recommendations by engaging stakeholders involved in the original team and/or the implementing agency. Assessors are asked to rate the degree of implementation on a scale of 0-10. Low rated recommendations are defined as recommendations receiving a 0-3 rating.

The Decision Tree, as illustrated on the next page, is intended to provide guidance on how to follow-up on low-rated recommendations. The Decision Tree will only be used for low-rated recommendations. The Committee will first follow-up with the implementer for information why a recommendation was not implemented. If no implementer is discernable, the Committee approaches a CASA team (if available) for information. Should neither be available, the Committee can make a recommendation to the CASA Board. Recommendations, whether from the implementer, CASA team or Committee, could include:
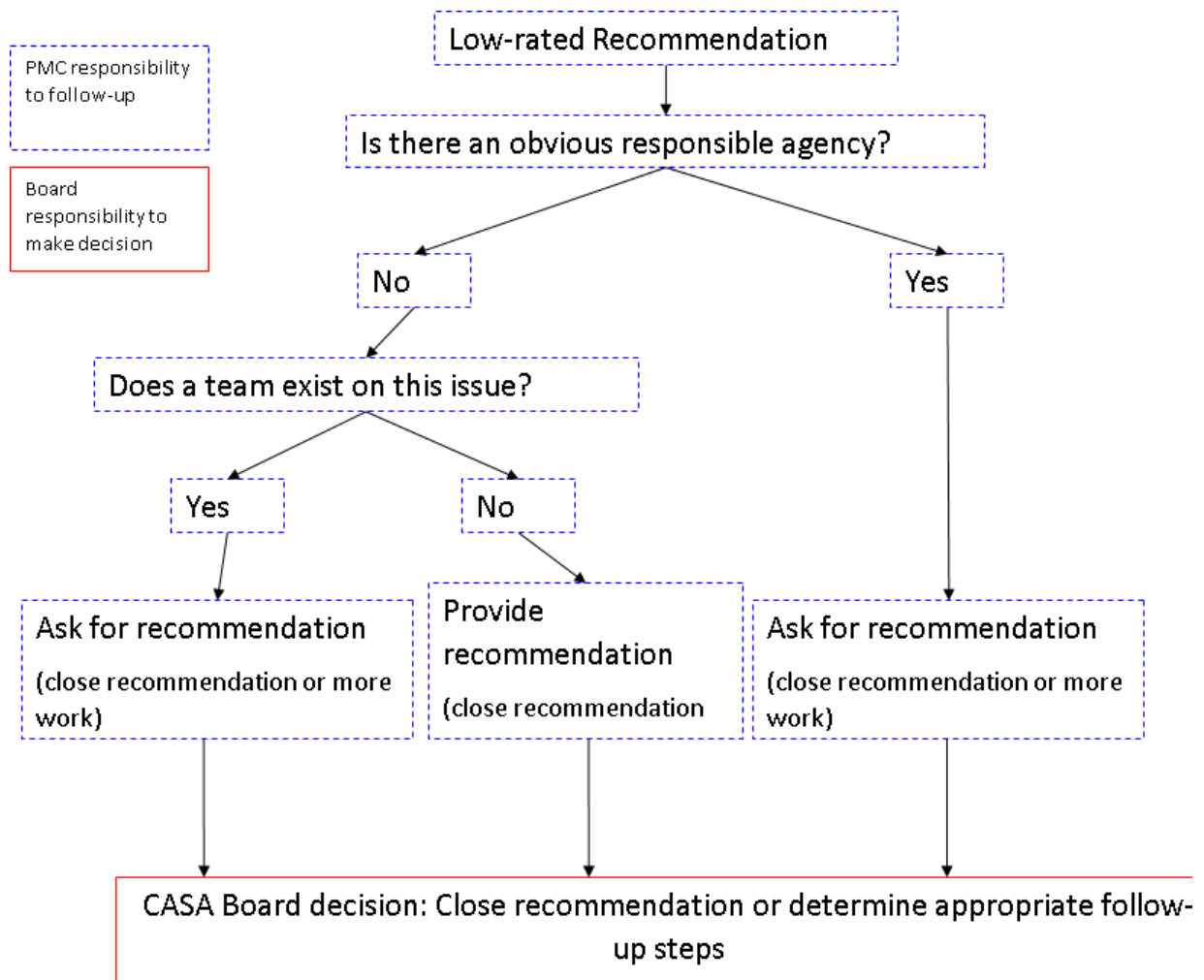
- Close the recommendation, and document the explanation
- More work that could be required, such as an implementation team, new work for an existing team, Board involvement, etc.
- More information the Board would require to make its decision regarding follow-up or closure of the recommendation.

CASA Board Decision

The Performance Measures Committee will use the information to advise the CASA Board on appropriate follow-up for the low-rated recommendation. The CASA Board has decision-making power whether to follow-up or to close the recommendation.

There are three criteria to inform the board's decision to close a recommendation:

1. Priority level: Is the current importance of the issue and/or recommendation high, medium or low?
2. Need for the recommendation: Given legal, technological, societal, and economic changes since the recommendation was made, is the action prescribed still needed?
3. Practical challenges: Given the current work of the implementing body, are the necessary resources and capacity available to implement the recommendation?

PMC responsibility to follow-up

Board responsibility to make decision

Low-rated Recommendation

Is there an obvious responsible agency?

No

Yes

Does a team exist on this issue?

Yes

No

Ask for recommendation

(close recommendation or more work)

Provide recommendation

(close recommendation

Ask for recommendation

(close recommendation or more work)

CASA Board decision: Close recommendation or determine appropriate follow-up steps

Appendix 3: Summary of Low-Rated Recommendations

Year	Project Team	Recommendation	Status
2002	Acidifying Emissions Project Team	3. Alberta Environment should lead an evaluation of the acidifying emissions management system every two to three years based on the evaluation process that has been established by AEMIT. Evaluation results should be reported to the CASA Board and the next evaluation should be done in 2003. This task would require Alberta Environment to complete the forms that AEMIT has developed and used to conduct its evaluation; these are: • the goals, objectives and performance measures table, and the evaluation protocols table.	Continue monitoring
2009	Ambient Monitoring Strategic Planning Project Team	18. The AMSP team recommends that the MIC: • Do a scientific, objective analysis to determine the appropriate network density for a province-wide network that will spatially represent air quality in Alberta. Use industry, airshed and government monitoring stations where possible to address gaps in air monitoring. An assessment of where these gaps are and what stations could be used to fill these gaps is required.	Continue Monitoring
2009	Ambient Monitoring Strategic Planning Project Team	26. The AMSP Project Team recommends that: Alberta Environment develop and maintain a comprehensive GIS-based provincial inventory of all relevant emission sources that influence provincial air quality commencing within one year following board approval.	Continue Monitoring
2009	2008 Electricity Framework Review	7. The following deemed credit thresholds for the 2011 BATEA standards be applied to new coalfired and gas-fired units: A. NOx (coal-fired) – 0.38 kg/MWh net B. SO2 – 0.55 kg/MWh net C. NOx (gas-fired) – "A" factor = 0.07 kg/MWh net and "B" factor = 0.008 kg/GJ Non-Peaking Standard Formula: NOx (kg/h) = [Net Power Output (MW net) x A] + [Heat Output (GJ/h) x B]	Continue monitoring
2015	2013 Electricity Framework Review	**Recommendation 5: Emissions Standards for New Diesel-Fired Reciprocating Engines (regular use units)** The 2013 Electricity Framework Review Project Team recommends that: The following standards apply to new diesel-fired reciprocating engines in regular use units that are approved on January 1, 2016 or later: > 1200 HP (0.89 MW) (<30 L displacement per cylinder): 0.50 g/bhp-hr (approximately 0.67 g/kWh) > 699 kW (805 HP) (≥30 L displacement per cylinder): 1.8 g/kWh (approximately 1.34 g/bhp-hr) These standards are expressed in a similar format to the US EPA Tier 4 Compression Ignition New Source Performance Standards, which include diesel-powered generator sets, and is based on selective catalytic reduction (SCR).	Monitor
	2013 Electricity	**Recommendation 6: Emissions Standards for New Diesel-**	Monitor

	Framework Review	**Fired Reciprocating Engines (stand-by units)** The 2013 Electricity Framework Review Project Team recommends that: The following standard apply to new diesel-fired reciprocating engines in stand-by units that are approved on January 1, 2016 or later: > 750 HP (0.560 MW) 4.8 g (NMHC+NOx)/bhp-hr (approximately 6.4 g (NOx+NMHC)/kWh) This standard is expressed in a similar format to the US EPA Tier 2 Compression Ignition New Source Performance Standards for generator sets, and is based on combustion controls (that is, no SCR).	
	2013 Electricity Framework Review	**Recommendation 7: Emissions Standards for New Natural Gas-Fired Reciprocating Engines** The 2013 Electricity Framework Review Project Team recommends that: The following standard apply to new natural gas-fired reciprocating engines that approved on January 1, 2016 or later: > 75 kW (500 hp is US size range): 2.7 g/kWh (based on 2.01 g/bhp-hr) This standard is based on the BLIERs for NOx for natural gas-fired reciprocating spark ignition engines, which are based on the US EPA requirements for these types of engines.	Monitor

Appendix 4: Number and Location of Air Monitoring Stations

As requested under recommendation three of the 2015 Performance Measures Review, the PMC has been asked to provide a snapshot of the number and location of air monitoring stations in the province of Alberta.

The percentage of monitoring stations and/or parameters implemented from the 2009 Ambient Monitoring Strategic Plan (AMSP).

|	2016	2013	2010
Population Based Completed:	63%	60%	57%
Ecosystem Based Completed:	25%	25%	20%
Ozone Completed:	61%	41%	52%
Background and Boundary Transport Completed:	44%	44%	44%
Pattern Recognition Completed:	47%	47%	40%
Overall Completed:	57%	52%	54%

New stations added to the network include the St. Albert monitoring station that was commissioned in April 2016. The Calgary Central-Inglewood and Calgary Southeast stations also were moved and began operating in April 2015 and April 2014, respectively. New focused monitoring for particulate matter speciation in the Red Deer area should also meet the AMSP monitoring objectives of upwind and downwind monitoring in the Parkland Airshed Management Zone. A new air monitoring station was deployed in April 2017 in Airdrie, however this is not included in the 2016 performance measure.

**Change in Peak Concentration of Selected Substances
(1994 – 2016)**
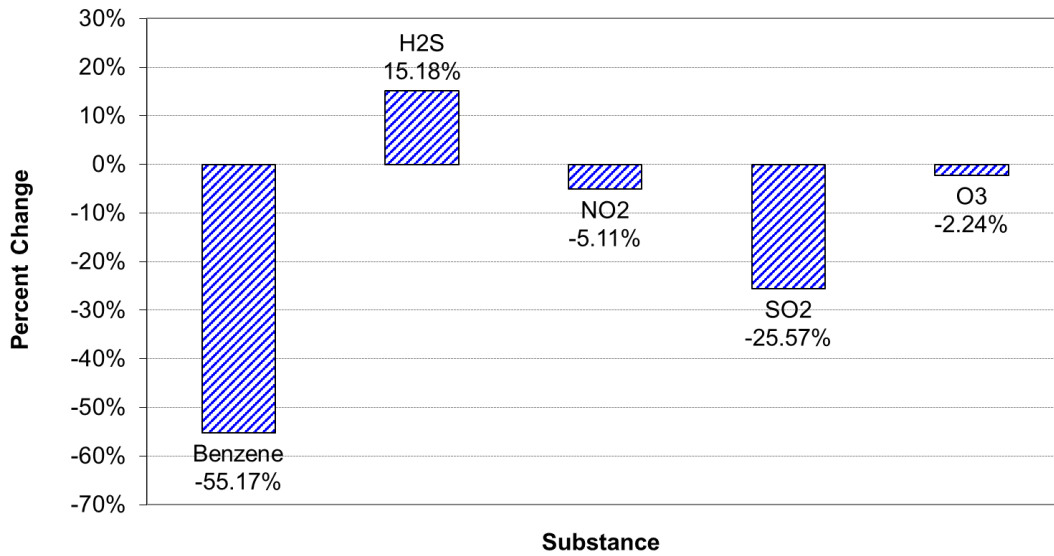
**Change in Average Concentration of Selected Substances (1994 –
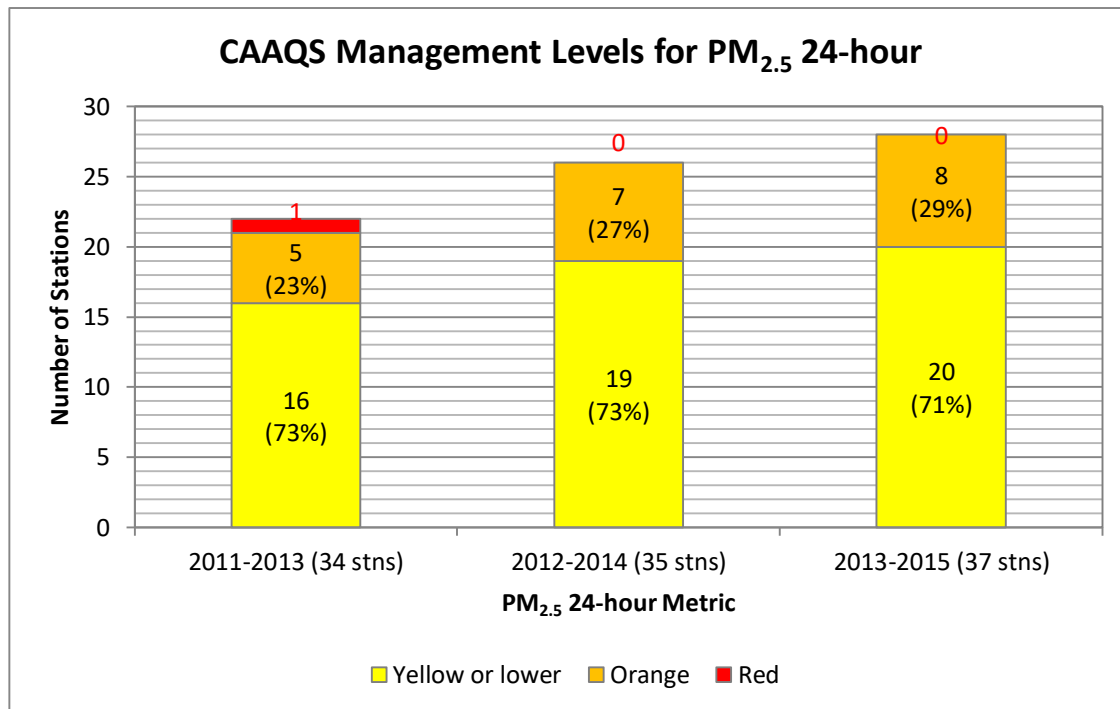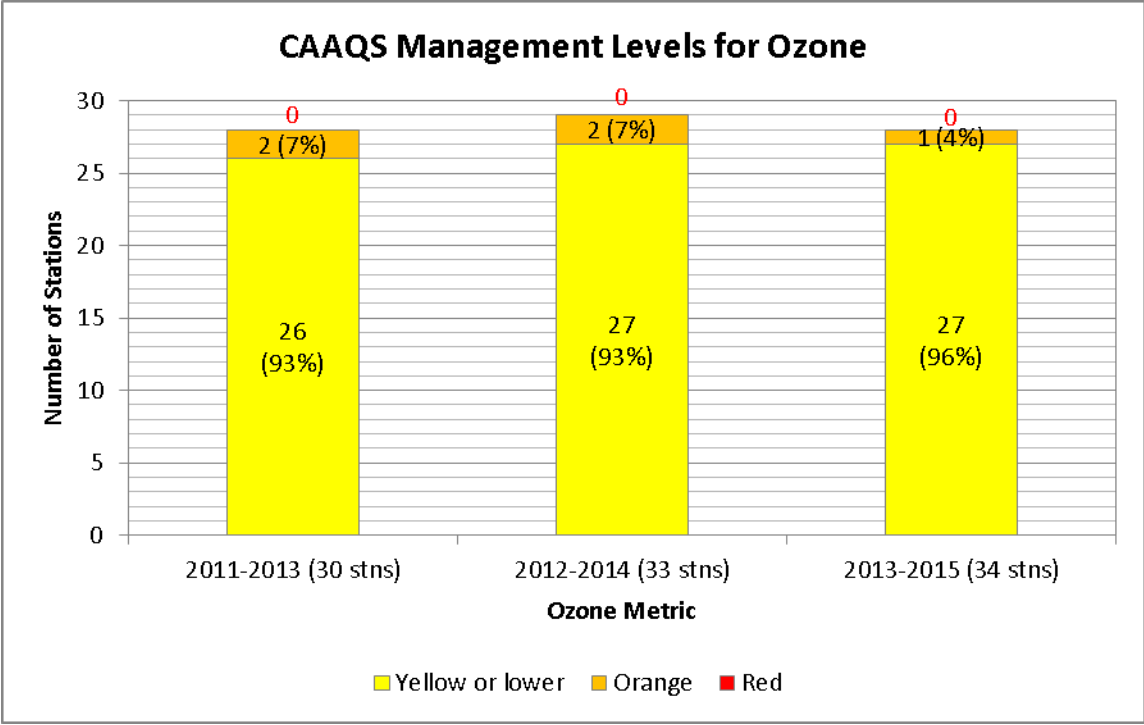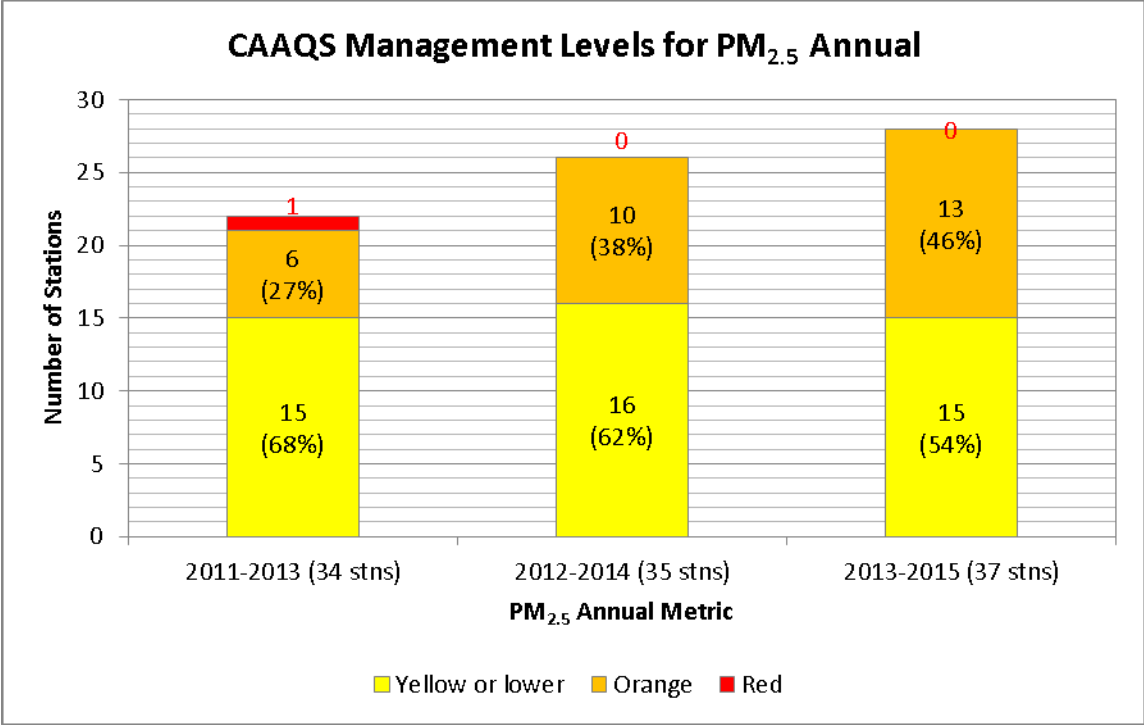2016)**
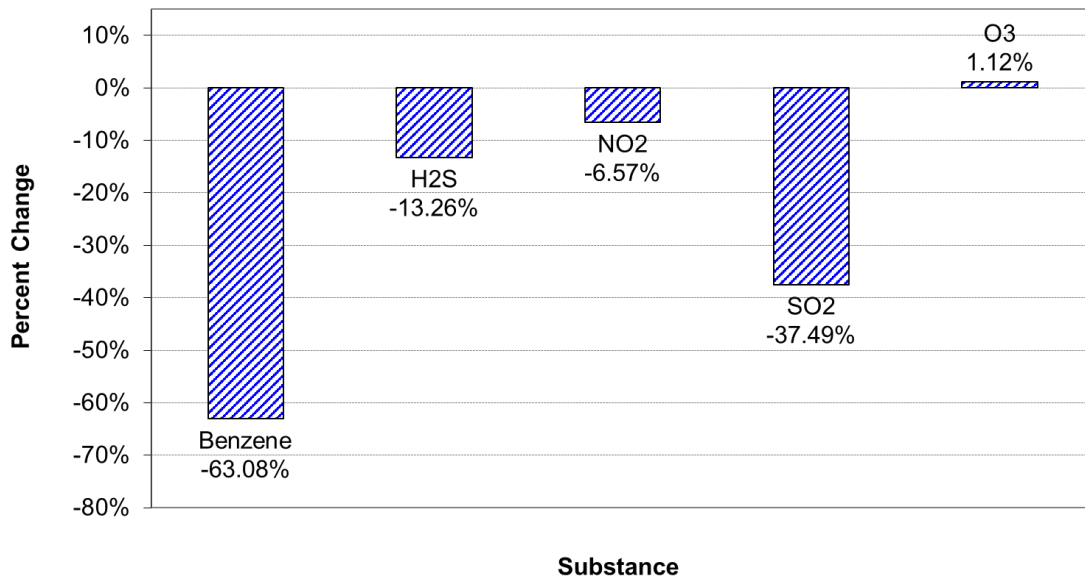
Percentage of Stations in Each Canadian Ambient Air Quality Standard Management Levels

Notes:
TF/EE analysis for the 2011-2013 and 2012-2014 assessment periods was completed for all stations in the red, orange, and yellow management levels. TF/EE analysis for the 2013-2015 assessment period was completed for all stations in the red and orange management levels only. Stations in the yellow management level prior to TF/EE analysis were not analyzed as removal of TF/EE would have resulted in the management level either moving to the green management level or remaining in the yellow management level (such stations are identified as "yellow or lower"). Management actions for stations in the yellow and green management levels do not need to be implemented. For consistency, all three assessment periods are presented with the following management levels: "Red", "Orange", and "Yellow or lower".

The total number of stations is indicated in the x-axis labels. This number may be lower than the total number of stations represented by the bar. This is due to some stations having insufficient data to calculate a three-year average concentration.

CAAQS Management Levels for PM$_{2.5}$ 24-hour

Assessment Period	Yellow or lower	Orange	Red
2011-2013 (34 stns)	16 (73%)	5 (23%)	1
2012-2014 (35 stns)	19 (73%)	7 (27%)	0
2013-2015 (37 stns)	20 (71%)	8 (29%)	0

Number of Stations — PM$_{2.5}$ 24-hour Metric

Legend: ☐ Yellow or lower ☐ Orange ■ Red

CAAQS Management Levels for PM$_{2.5}$ Annual

CAAQS Management Levels for Ozone

Percentage of modelled grid cells falling within each acid deposition load level

Model-predicted PAI values were below the Monitoring Load as outlined in the Alberta Acid Deposition Management Framework. The current assessment was conducted in accordance with the Alberta Acid Deposition Management Framework and did not identify areas within Alberta that exceeded deposition criteria for acidifying substances. Relative to predicted PAI for 2006, a general decrease is observed in predicted PAI when using the projected 2020 emissions. The current assessment using projected emissions for 2020 did not identify acid deposition patterns over the long term that exceeded deposition criteria. It should be noted, however, that at regional or local levels, site-specific modelling and/or deposition assessment criteria may identify areas that require acidifying emissions management.

Acid deposition loadings as fractions (Load %) of Critical, Target and Monitoring Loads (Figures 1 to 3) for each grid cell were calculated using the RELAD modelled PAI for 2006, and 2020 and the receptor sensitivity map for Alberta (Figure 8). The highest modelled PAI for 2006 emissions for any grid cell was 60% of the Critical Load, 67% of the Target Load and 86% of the Monitoring Load. This modelled PAI for 2006 emissions was predicted for a grid cell in the Killam-Hardisty area east of the Edmonton-Calgary corridor. PAI between 60 to 80% of the Monitoring Load was predicted for the Wabamun area, east of the Capital Region, north-east of Calgary and the Fort McMurray area.
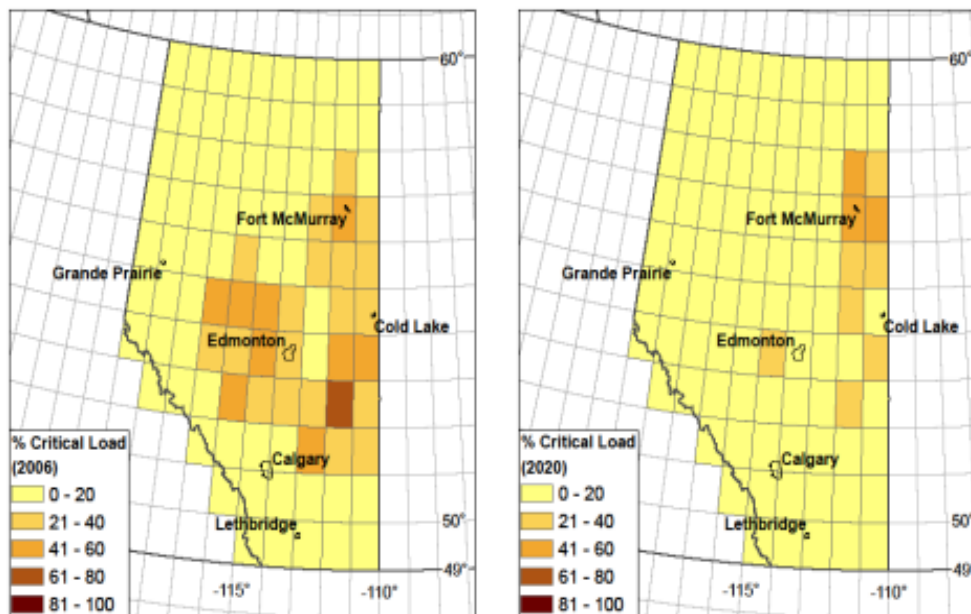

Figure 1. Acid deposition loading as a percent (%) of the Critical Load for the years 2006 (left) and 2020-projected (right). [4]

---

[4] Figures 1~3: 2011 Acid Deposition Assessment for Alberta (http://aep.alberta.ca/air/management-frameworks/acid-deposition/documents/2011AcidDepositionAssessment-Jul2014.pdf).
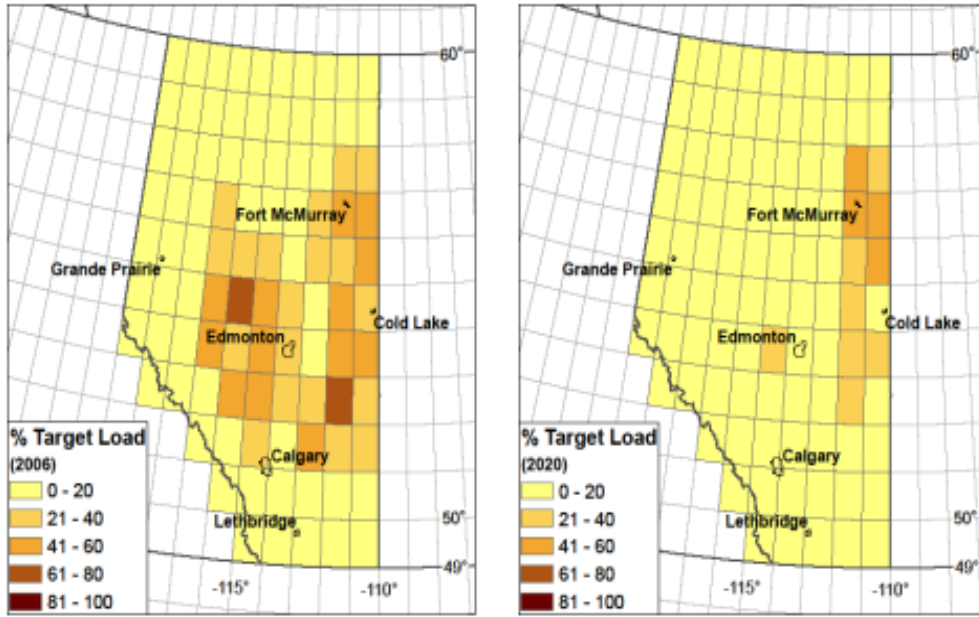
Figure 2. Acid deposition loading as a percent (%)of the Target Load for the years 2006 (left) and 2020-projected (right).
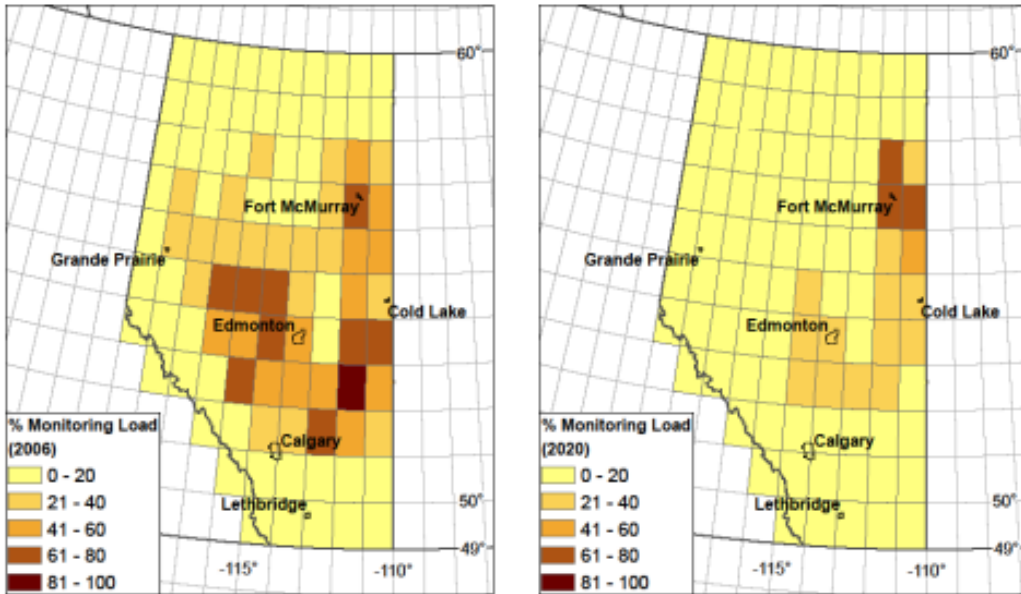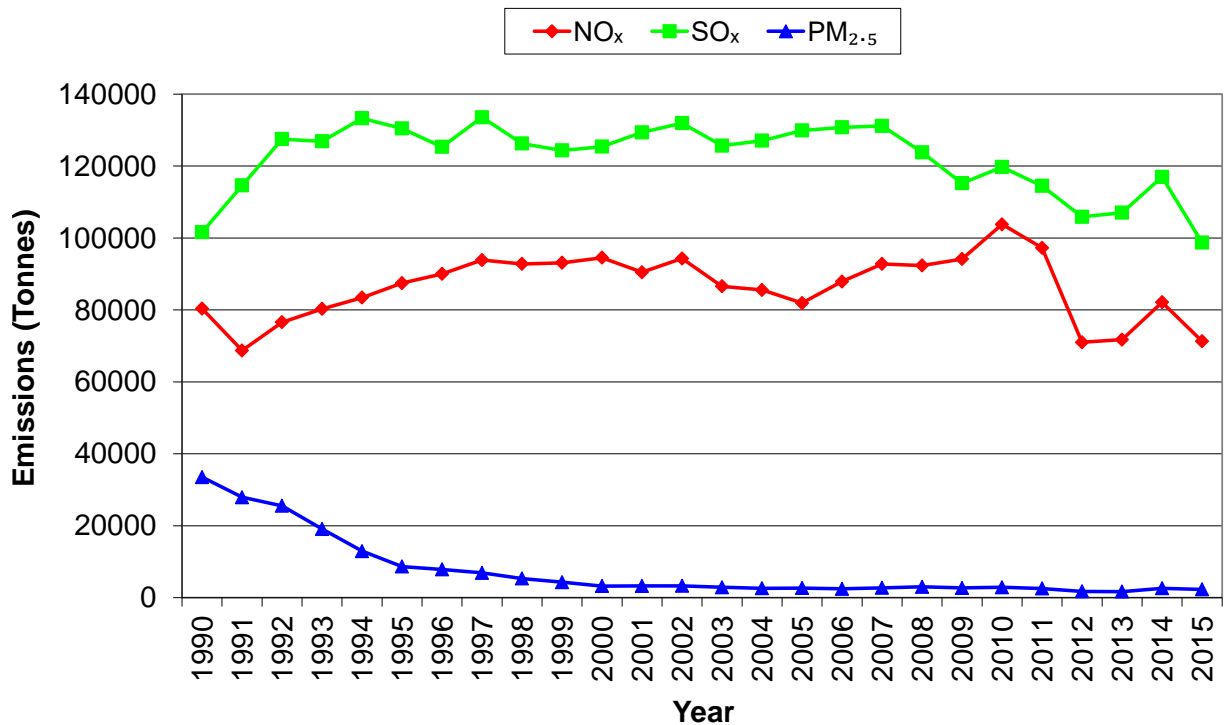

Figure 3. Acid deposition loading as a percent (%)of the Monitoring Load for the years 2006 (left) and 2020-projected (right).

CAC Emissions from the Electricity Generation Sector

The emissions for NO_X, SO_X, and primary $PM_{2.5}$ have been recalculated for some previous years relative to the last time this performance measure was reported. Previously, 1990, 1995, 2000, 2002 and 2003 were the only years available prior to 2005, at which point data became available every year. Now data for every year from 1990 forward are available, and the measure has been restated using these updated data. Testing for statistical significance in the trends for these emissions totals was performed, and indicates that there is a statistically significant decreasing trend in $PM_{2.5}$ emissions, falling by 92% from 1990 to 2015. There is a potentially significant trend in SO_X emissions, however it may be the result of autocorrelation effects, therefore it is advisable to wait and test again when more data become available. There is no significant trend in the NO_X emissions.

In some years, the restated data show different results from the data reported previously. Most notably, the PM emissions total for 1990 was 12,938 tonnes before, but has been restated as 33,534 tonnes, about 2.5 times higher. Results from 1995 forward are similar to what has been reported in the past. Since this is an increase at the beginning of the time series, this could potentially have had an impact on the statistical significance of the trend. Therefore, the test was run a second time, on data from 1994 (the year of CASA's founding, and the starting year for the ambient measures) forward. The results from this test once again show a statistically significant decreasing trend, with a 92% decrease from 1994 to 2015.

Note: Emissions data are only available up to 2015.

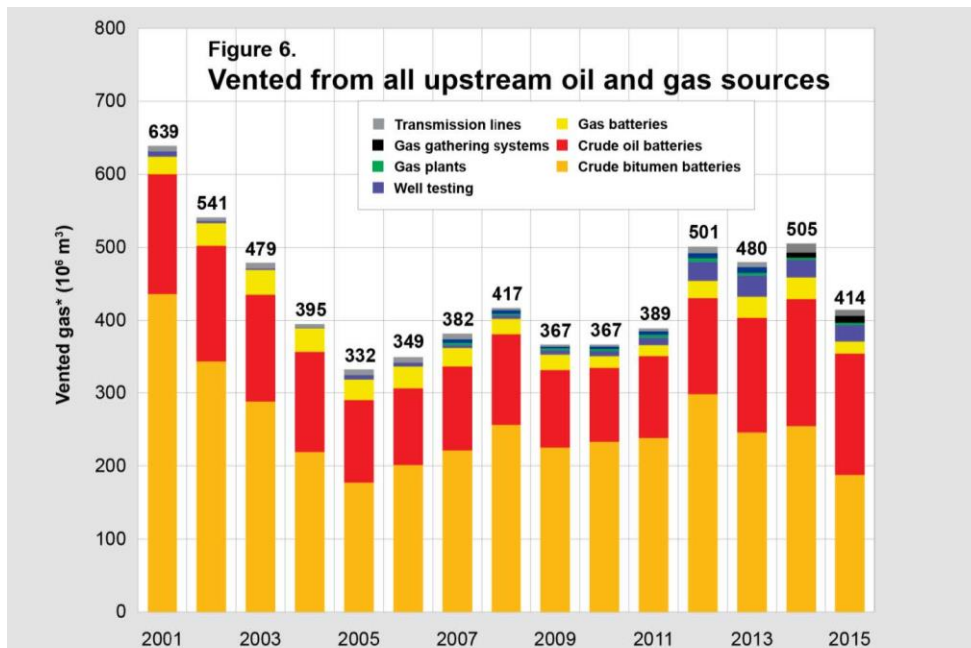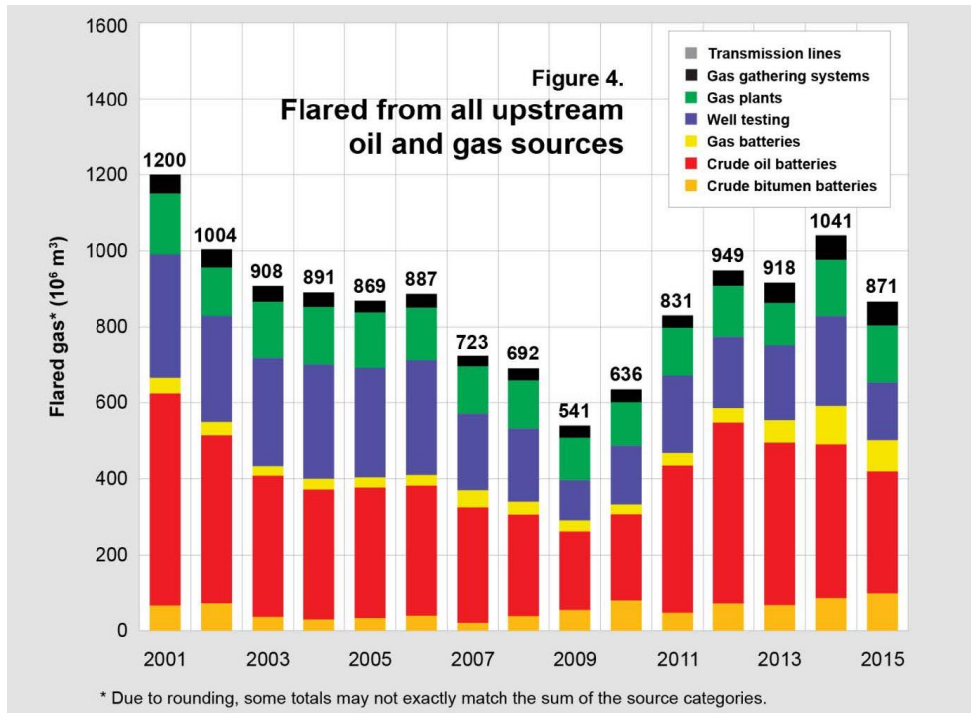## Mercury Emissions from the Electricity Generation Sector
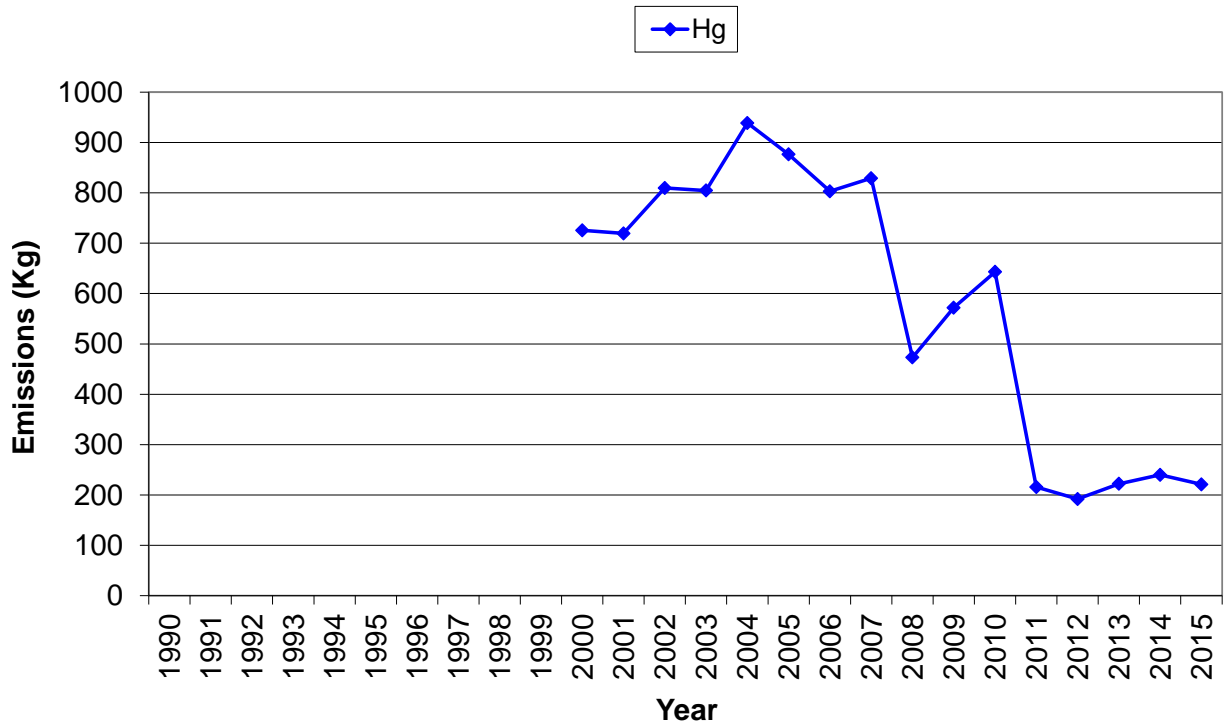
2011 was the most recent year of mercury emissions data available when this measure was reported last. Results since then show relative stability in mercury emissions, ranging from 192 Kg in 2012 to 240 Kg in 2014. This is a substantial reduction from the previous low of 473 Kg in 2008.

Percent compliance with Ambient Air Quality Objectives
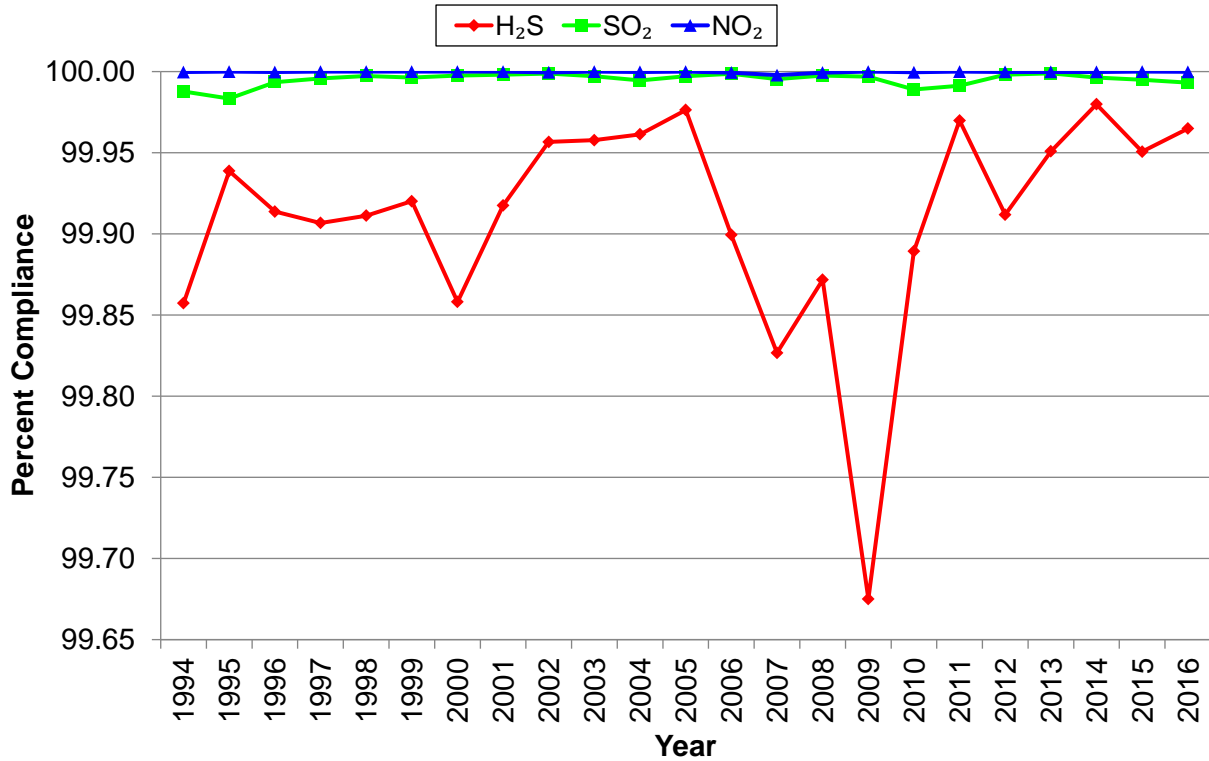
Compliance with Ambient Air Quality Objectives is consistent with previous reporting. NO_2 continues to have virtually 100% compliance. SO_2 shows some variation year-to-year, but compliance is generally very high. Compliance with the H_2S objective has also been relatively high, better than 99.95%, over the past 4 years, which is in line with other years with high compliance. None of these trends is statistically significant.

Flared and Vented Volumes

Figure 4. Flared from all upstream oil and gas sources

* Due to rounding, some totals may not exactly match the sum of the source categories.

Figure 6. Vented from all upstream oil and gas sources

* Due to rounding, some totals may not exactly match the sum of the source categories.

For further detail please read the *Upstream Petroleum Industry Flaring and Venting Report by* the Alberta Energy Regulator, available here: http://aer.ca/documents/sts/ST60B-2016.pdf